



World Wide Use of PreKote Surface Pretreatment





Pantheon Chemical

Our Sustainment Mission

- Replace widely used hazardous products and processes with high performance technologies
- Resolve complex problems, resulting in cost savings and more sustainable business
- Shatter the myth that 'safe' technologies are more expensive, less effective and harder to implement
- Improve worker safety and the environment



Aerospace Paint Process

- **PreKote Replaces**
 - Chromic Acid Use
 - Alkaline Wash and Cleaning
 - Acid Deoxidizing
 - H_3PO_4 , HF , HNO_3
 - Solvent Wipe and Cleaning Use



United States Occupational, Safety, & Health Administration Cr(VI) Facts

According to the Crump Report (1995) and the John Hopkins Report (2000), exposure to the current PEL (100g/m³) over a 45 year working lifetime could be expected to result in between ***88 and 342 excess cancer deaths per 1000 workers.***





Largest Source of Coating Failure: **Poor Surface Pretreatment**

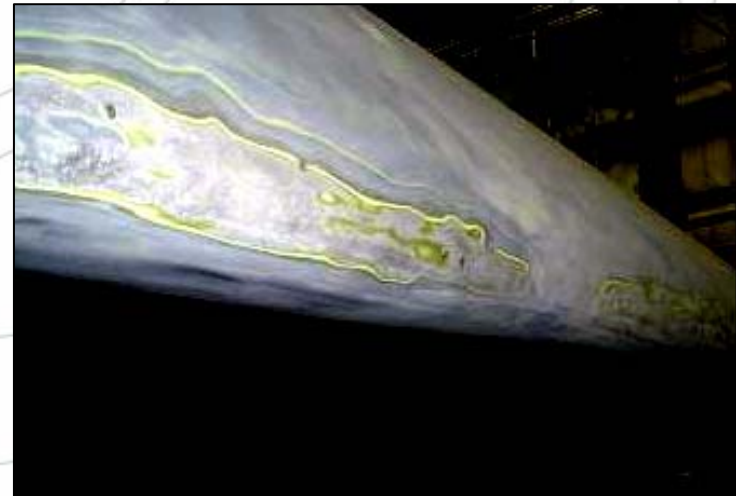


PreKote®

Surface Pretreatment



C-130
April 2, 2002
Alodine side



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Surface Pretreatment



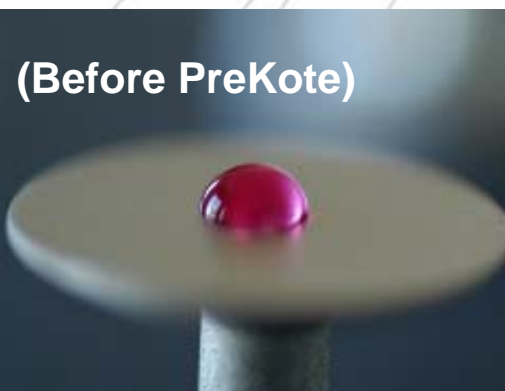


Proven Non-Chrome Pretreatment System

- All metal substrates prior to priming, painting and metal to metal bonding- Al, Mg, Ti, Cd plate, Steel
- All composite substrates
- Cleaning and adhesion promotion
- Application processes: manual, spray, power washer and immersion process
- Non-corrosive, non-flammable, non-toxic, CFC free, ODS free and odor free
- Readily biodegradable
- Compliant with European Union directive 2000/53/EC



- PreKote uses a total systems approach
- Modifies surface energy and surface tension
 - deposition of multifunctional molecules that draw paint into the substrate and flow over micro-contaminants.
- Adhesion promoting molecules
 - increase paint to substrate bonding, promoting excellent corrosion results with chromated/nonchromated coatings
- Enhances coatings barrier performance
 - site damage minimization and corrosion migration from these sites, reduces undercutting and pitting



(Before PreKote)



(After PreKote)

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Surface Pretreatment



Does Not Cause Cracks

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Surface Pretreatment



No Added Aircraft Weight



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Surface Pretreatment



Less Personal Protection Equipment Required





Improved Impact Resistance





Cr(VI) Sources

Exterior **Paint** Maintenance

- Primers:
 - Chromated wash primer, chromated & nonchromated polyurethane primer system, high VOC, low solids
 - Chromated epoxy primer, high VOC, low solids
 - Chromated epoxy primer, low VOC
- Stripping of low solubility chromated primer involves easily managed sludge



Exterior Pretreatment

Chromic acid is a greater hazard to humans and the environment due to the difference in solubility.

- Chromic Acid (CrO_3) solubility is 61.7g per 100ml in cold water
- Strontium Chromate (SrCrO_4) solubility is 0.12g per 100ml in cold water
- Large quantities of water used to rinse chromic acid becomes tainted



Cleaning/Metal Oxide Removal

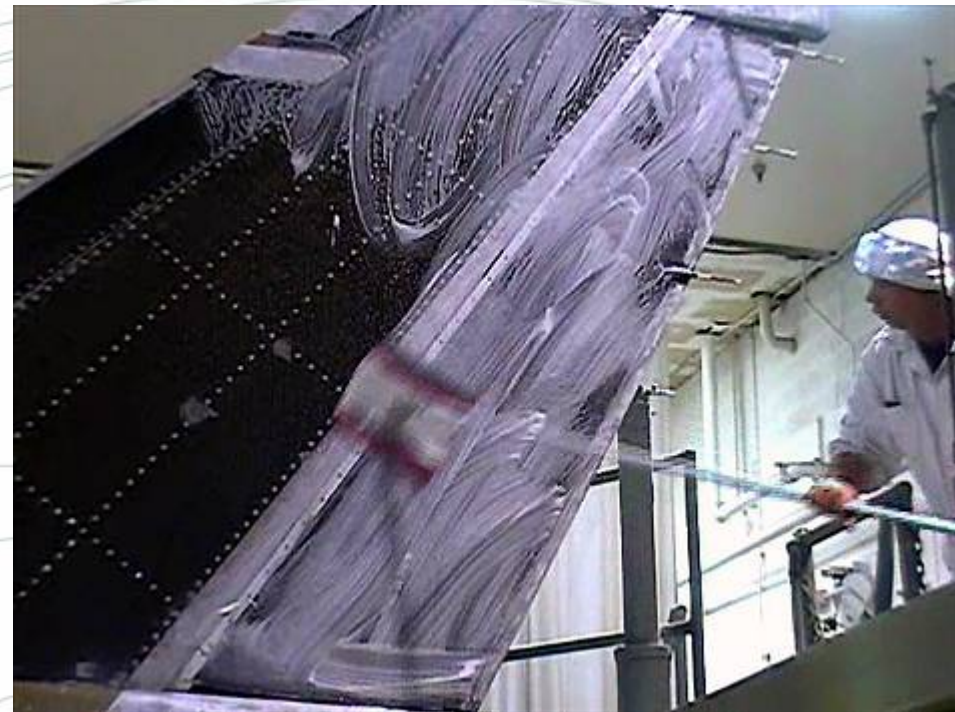
- Every coating operation requires pretreatment





Cleaning / Metal Oxide Removal

- PreKote is used as part of the cleaning and deoxidizing of the aircraft exterior





Cleaning / Metal Oxide Removal

- Other surface pretreatments require acid deoxidizing step used prior to use





Cleaning / Metal Oxide Removal

- PreKote fits into any process by user choice





Commercial Aircraft Testing

PreKote Successfully Passed:

- **Condensing Humidity**
- **Rain Erosion**
- **3000 Hour Salt Spray**
- **Filiform Corrosion**
- **Wet and Dry Scribe Adhesion**
- **Paint Softening**
- **Acrylic Crazing**
- **Sandwich Corrosion**





Military Laboratory Testing

- **Laboratory results by USAF**
 - Confirmed SYSTEM performance met or exceeded standards
 - Met Mil Spec corrosion testing
 - Met Mil Spec adhesion testing
 - Met Mil Spec flexibility testing, exceeded chromate conversion coating
- **2001 Boeing Mesa product validation lab tests**
- **Considered baseline for non-chrome surface pretreatment studies**



Implementation

Bill Joy, a founder of Sun Microsystems, states that “... *to expect companies to be socially responsible without an economic incentive is asking a lot. I just don't see companies taking on anything other than what they and their competitors are required to do.*”



PreKote Cost Savings

Reduced Costs in EVERY Application

- **Eliminate hexavalent chromium**
- **Removal Alkaline Wash and Acid Deoxidizer**
- **Environmental Waste Disposal**
- **Waste Water Treatment**
- **Personal Protection Equipment**
- **Healthcare Costs**
- **Labor Time**
- **Reduced Masking & Process Steps**
- **Cadmium leaching**



PreKote: In-flight validation

- 1995: Magnesium gear boxes
- 1996: USAF AETC 500+ aircraft to date, 2003 mandate for AETC implementation





PreKote: In-flight validation

- 1997: F-16's with 1200+ flying





PreKote: In-flight validation

- 2001: 2 C-130s/A-10s in USAF sponsored test





PreKote: In-flight validation

- **2002: Boeing Mesa (Apache) Field tests begin**





PreKote: In-flight validation

- 2003: KC-135 test vs chromic acid
- 2003 and 2004: B-52 applications





PreKote: In-flight validation

- 2004: 4 B-1Bs and E-3 at Tinker AFB & T.O. 1-1-8
- Boeing Commercial Airline Approval & Continental Airlines



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Surface Pretreatment





The MONITOR

Aeronautical Systems Center (ASC/ENVV)

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PREKOTE: AN ALTERNATE SOLUTION TO THE USE OF CHROME CONVERSION COATING



The SHEPPARD SENATOR

Wichita Falls, Texas
Vol. 36 No. 8
July 18, 2003

Sheppard Air Force Base, Texas, home of the 38th Training Wing and 401st Flying Training Wing

SILVER WINGS

Vol. 10, Issue 20
Columbus Air Force Base, Miss.
July 18, 2003

"Team improves aircraft painting"

"PreKoting the Environment"

on of this technology transfer effort are documented in the *Solutions* Database and some of the key points related to this solutions are provided below.

flammable, non-hazardous, non-corrosive, and free of phosphates and heavy metals. The ideal application procedure is spraying and scrubbing the surface and then air-drying. The process is repeated a second time

Times Record News

"SAFB painting process leaves far less waste"



PROACT CROSS TALK

An Environmental Resource sponsored by HQ Air Force Center for Environmental Excellence

"From Alodine to PreKote: A P2 Success Story"



PreKote Recent Awards & Nominations



Awarded: EPA Region 8 Environmental Excellence Award

Nominated: White House Closing the Circle Award



**Texas Environmental
Excellence Award**

Nominated: Texas Environmental Excellence Award



Documented Savings

- 30%-45% man-hours saved per aircraft (T-1, T-37 & T-38s)
 - Source: *ProAct Air Force Center for Environmental Excellence Cross Talk*
- 19.4 man-hours saved per F-16=3,880 hours annually
 - Source: *F-16 IDEA Program submittal*
- \$58,000 per year and 141,000 lbs. of hazardous waste
 - Source: *Sheppard Senator, Sheppard Air Force Base*
- \$6,000 saved per F-16 = \$1,200,000 per year!
 - Source: *Monitor Aeronautical Systems Center 2004*
- One third to one half the amount of water used in process
 - Source: *U.S. EPA CIU Determination Letter*

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PreKote Environmental Closed Loop

- Reduce human exposure and environmental impact
- Improve downstream manufacturing processes
- Reduce extraction of Earth's non-renewable resources from upstream activities
- Overall risk minimization due to in-flight performance record as a part of the coating system versus specification testing

So, let's focus on having the courage to apply our creativity and knowledge to positively impact our aerospace community.

In partnership, we can be stewards for the environment in which we work, live, and play.



Next.....



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